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TECHNICAL EVALUATION OF METAL DETECTORS FOR CONCEALED WEAPONS

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JUNE 1971
TECHNICAL MEMORANDUM

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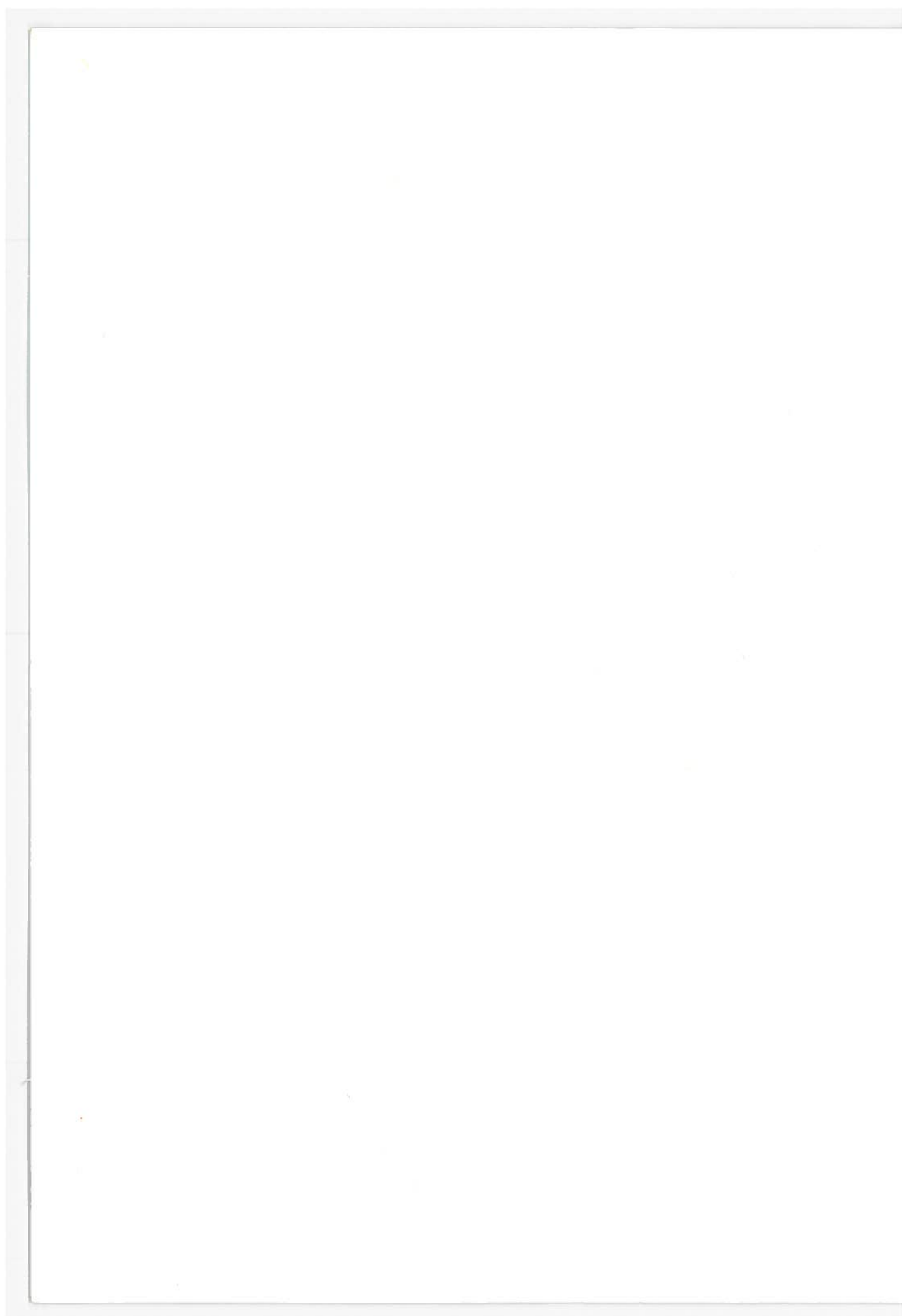
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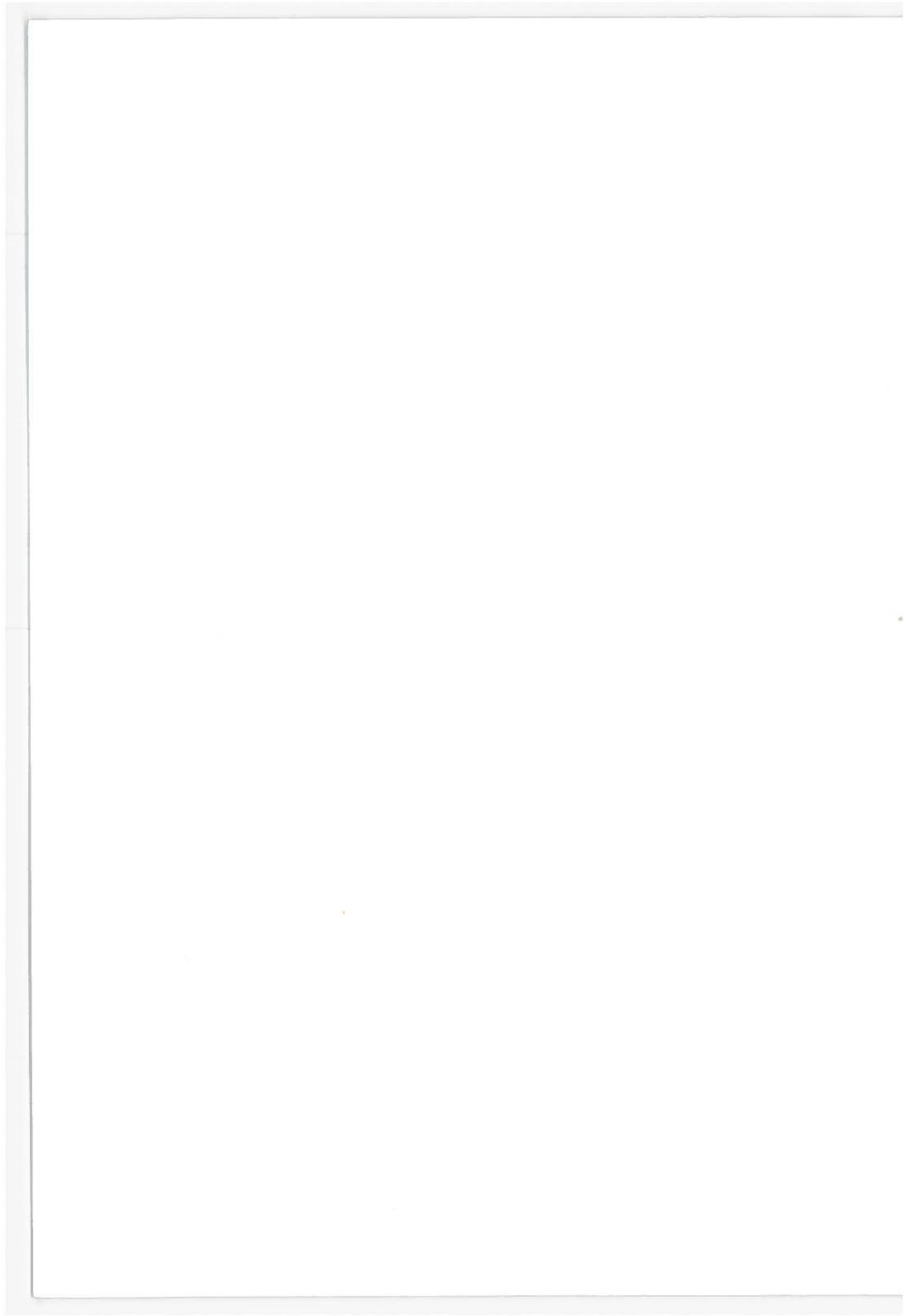
This document presents a classification and technical evaluation of eighteen commercial metal detectors. The classification distinguishes two main categories, hand-held devices and walk-through installations. Six subcategories account for detector response to material and location of metallic objects concealed on a subject. The evaluation is based partly on extensive laboratory tests at TSC and partly on tests at major airports by TSC and by other government agencies. The tests demonstrated the necessity to separate passengers from their hand luggage (for separate screening) in order to minimize false alarms. The results of the evaluation are presented in four charts where the eighteen detectors are ranked in order of performance and capital cost effectiveness. The ranking is adjusted for defined situations of high risk and low risk. Three hand-held detectors and one walk-through installation merit top ranking in all charts. A more realistic assessment of total cost effectiveness is shown to be necessary, which would be based on both the findings of this study and on technical and economic operational data.

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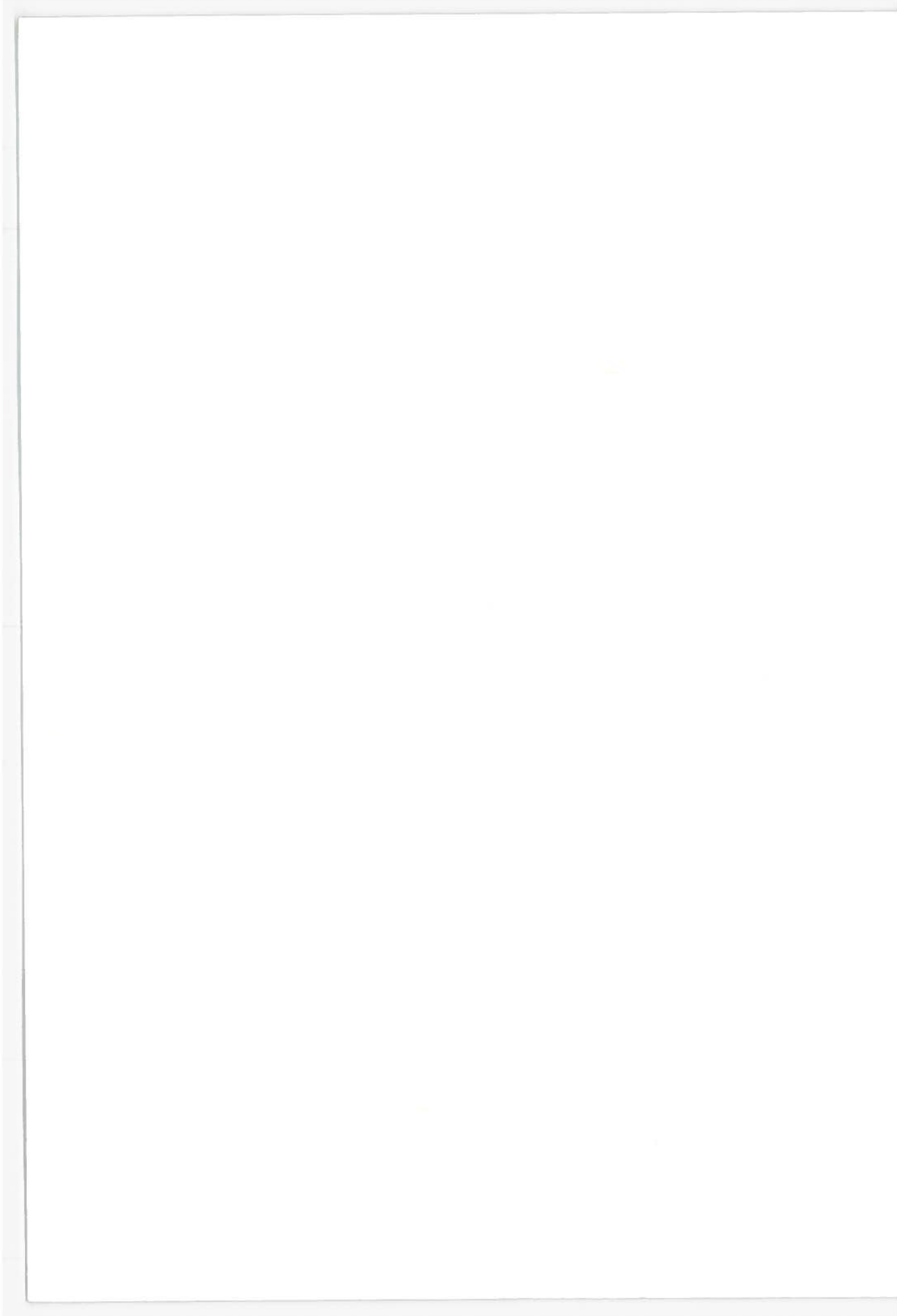


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TECHNICAL EVALUATION OF METAL DETECTORS FOR CONCEALED WEAPONS

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Transportation Systems Center

1.0 INTRODUCTION

The detection of concealed metallic weapons constitutes one of the key elements in the screening of U. S. airline passengers. To meet this requirement, various types of metal detectors are being offered commercially, covering the price range from \$135 to \$8,000. Over the past several months, TSC has conducted a program of evaluating the technical performance of these devices. Many were purchased and tested extensively at TSC under laboratory conditions; others were examined at several major airport installations. Performance data were also obtained from airlines and government agencies.

2.0 CLASSIFICATION OF METAL DETECTORS

Metal detectors fall into two major groups, small lightweight hand-held devices and walk-through installations. Some detectors respond only to the presence of magnetic metals (iron and most steels), others respond to the presence of all metals, regardless of magnetic properties (stainless steel, brass, copper, aluminum, nickel, lead, zinc, tin, etc.). Hand-held devices intrinsically permit "frisking" of a subject without body contact; in this manner the location of concealed metal objects is readily determined. Walk-through devices, on the other hand, in their simplest configuration, respond to the presence of metal objects without indicating their location. It is more complicated (and more costly) to provide location discrimination. As shown in Figure 1, it is possible to distinguish six detector subgroups,

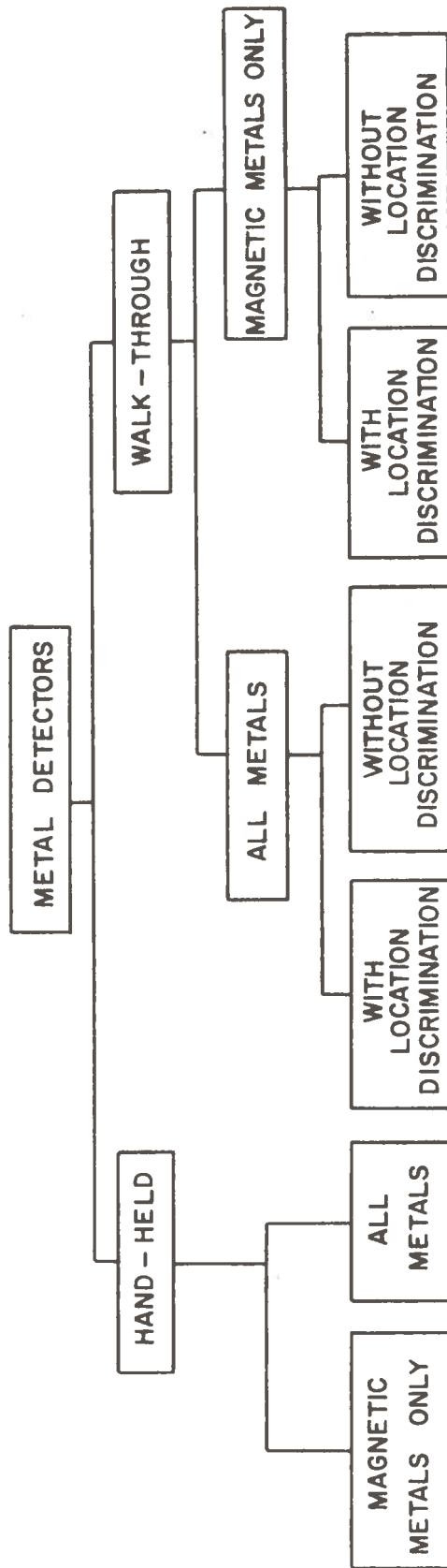


Figure 1. Classification of Metal Detectors

depending on operating mode and performance characteristics. This classification scheme forms the basis of the present report.

3.0 PERFORMANCE EVALUATION OF METAL DETECTORS

The results reported here have been obtained during the period January through June 1971. To ensure that the information on models and prices is not obsolete, manufacturers have been contacted during July and new quotations have been obtained where possible. Detector models and their cost ranking is presented in Figure 2. Detailed information on each detector is listed on a separate page in the Appendix, including physical description, mode of operation and summary technical evaluation.

The technical performance evaluation of the detectors is based on a combination of numerical factors which were obtained in the following manner:

1. Response Factor. Ten typical weapons were selected as listed in Table 1. Each weapon was concealed on a test subject at ten different positions and exposed to the detector. Positive detector response scored one point for each test, making a perfect score of 100 for the 100 tests of each detector.
2. False Alarm Factor. This multiplying factor is a measure of the number of false alarms when no weapons were carried by the subject. The numerical value of this factor is given by 1.00 minus the percentage of false alarms. Thus, a rating of 0.8 indicates a 20% false alarm rate, a factor of 0.6 a 40% false alarm rate, etc.
3. Disturbance Factor. This multiplying factor is a measure of detector response to extraneous metal objects and electrical disturbances. It was obtained in the same manner as the False Alarm Factor. For example, a rating of 0.9 implies good shielding, a rating of 0.6 is inferior.

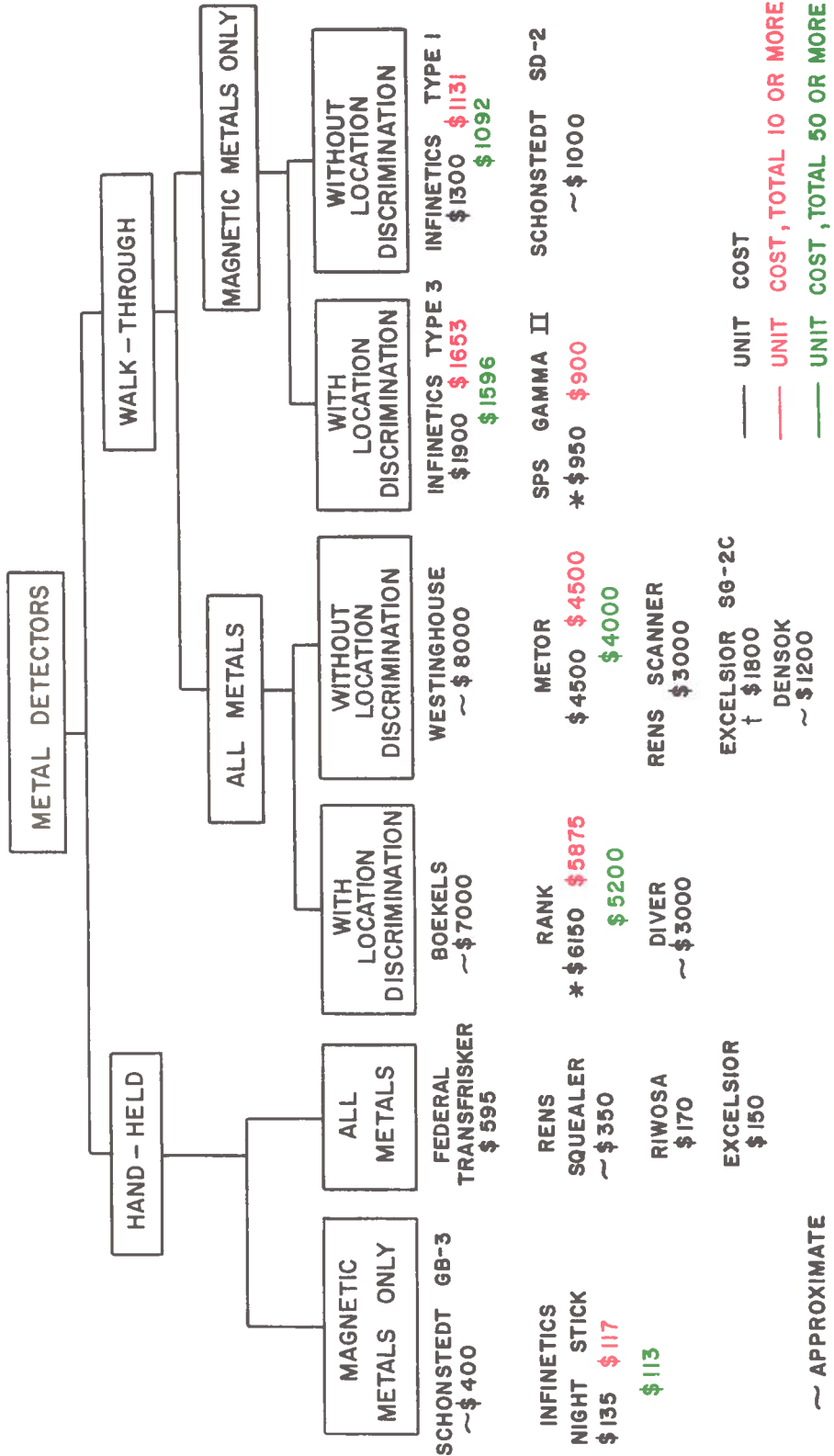


Figure 2. Cost Ranking of Metal Detectors

.22 automatic
.25 long revolver
.30 revolver
.38 aluminum frame revolver
.38 stainless revolver (slightly magnetized)
3 1/2-inch single-blade knife
5-inch Bowie knife
Stiletto (long needle)
beryllium-copper simulated weapon (hammer-claw)
hand grenade

Table I. Test Weapons

4. Convenience Factor. This multiplying factor is a measure of detector stability and ease of handling. A rating of 0.8 implies average, 0.7 below average and 0.9 above average performance.

3.1 HIGH-RISK PERFORMANCE RANKING

A situation of high risk is defined by one of the following conditions: Long distance service between large cities (large aircraft), service near a national border, international service, service at period of national or international political tension, threat of sabotage. High-risk performance is scored as follows: (Response Factor) X (False Alarm Factor) X (Disturbance Factor) X (Convenience Factor); add 5 points for location discrimination, subtract 6 points where detection is limited to only magnetic metals.

3.2 LOW-RISK PERFORMANCE RANKING

A situation of low risk is defined by one of the following conditions: Short or medium distance service (small or medium size aircraft), shuttle or commuter service, service remote from a national border. Compared with the high-risk situation, the tolerance to false alarms is lower, as is the likelihood of the use of sophisticated (nonmagnetic) weapons. Consequently, low-risk performance is scored as follows: (High-Risk Performance Score) X (False Alarm Factor); add 3 points where detection is limited to only magnetic metals.

3.3 PERFORMANCE SCORE

In order to obtain a meaningful interpretation of the numerical performance ranking, it is necessary to separate hand-held detectors from walk-through installations. Hand-held detectors for all metals yield a perfect score, hand-held detectors for magnetic metals, of course, score lower because

of this limitation. In view of the close proximity of hand-held detectors to the subject, no false alarms or extraneous disturbances were observed during testing. The only performance difference among hand-held detectors in a given subgroup was their ability to discriminate between small innocuous metal objects (coins, belt buckles, etc.) and weapons. For this reason, the numerical performance score reported here is confined to twelve walk-through installations (Tables II and III). Based on the classification into subgroups, the ranking of all detectors evaluated is also presented in two charts, high-risk performance ranking (Figure 3) and low-risk performance ranking (Figure 4). These charts employ a color code for the three categories good to excellent, acceptable (good) and acceptable (fair).

It should be noted that the numerical performance ranking scheme may to some degree be influenced by subjective decisions on the part of the evaluator. A numerical ranking of 40 is clearly superior to a ranking of 20, but different observers might conceivably obtain respective rankings of 35 and 25 for the two detectors in question. Differences in the score by less than a value of 5 should be considered insignificant; differences exceeding a value of 10, on the other hand, are valid and meaningful.

4.0 CAPITAL COST EFFECTIVENESS EVALUATION OF METAL DETECTORS

In view of the wide range of capital cost of the various detectors, it is appropriate to consider a ranking scheme which modifies the performance ranking in terms of capital cost effectiveness.

4.1 HIGH-RISK CAPITAL COST-EFFECTIVENESS RANKING

For a capital cost below \$3,000, add ten points to the high risk performance score; for a capital cost above \$3,000, add ten points minus one point for each \$200 in excess of \$3,000. For example, a detector costing \$3,600 merits 7 additional points. The high-risk capital cost-

Detector	Response Factor	Flase Alarm Factor	Disturbance Factor	Convenience Factor	Location Discrimination	Magnetic Metals Only	High-Risk Score
Boekels*	90	0.9	0.9	0.8	+5		64
Rank	89	0.7	0.8	0.8	+5		45
Divert†	71	0.5	0.6	0.7	+5		21
Westinghouse	82	0.9	0.9	0.8			53
Metor	89	0.8	0.9	0.9			58
Rens†	89	0.6	0.8	0.8			35
Excelsior	70	0.6	0.8	0.8			27
Densok	65	0.6	0.7	0.7			20
Infinetics 3†	73	0.8	0.8	0.9	+5	-6	40
SPS	61	0.8	0.8	0.7	+5	-6	27
Infinetics 1	63	0.7	0.7	0.9		-6	22
Schonstedt	56	0.7	0.7	0.9		-6	19

*Score extrapolated from results reported by Federal Republic of Germany

†Score extrapolated from limited field tests.

Table II. Numerical High-Risk Performance Score of Walk-Through Installations

Detector	High-Risk Score From Table II	Flase Alarm Factor	Magnetic Metals Only	Low Risk Score
Boekels*	64	0.9		58
Rank	45	0.7		32
Divert†	21	0.5		11
Westinghouse	53	0.9		48
Metor	58	0.8		46
Rens†	35	0.6		21
Excelsior	27	0.6		17
Densok	20	0.6		12
Infinetics 3†	40	0.8	+3	35
SPS	27	0.8	+3	25
Infinetics 1	22	0.7	+3	19
Schonstedt	19	0.7	+3	16

*Score extrapolated from results reported by Federal Republic of Germany.

†Score extrapolated from limited field tests.

Table III. Numerical Low-Risk Performance Score of Walk-Through Installations

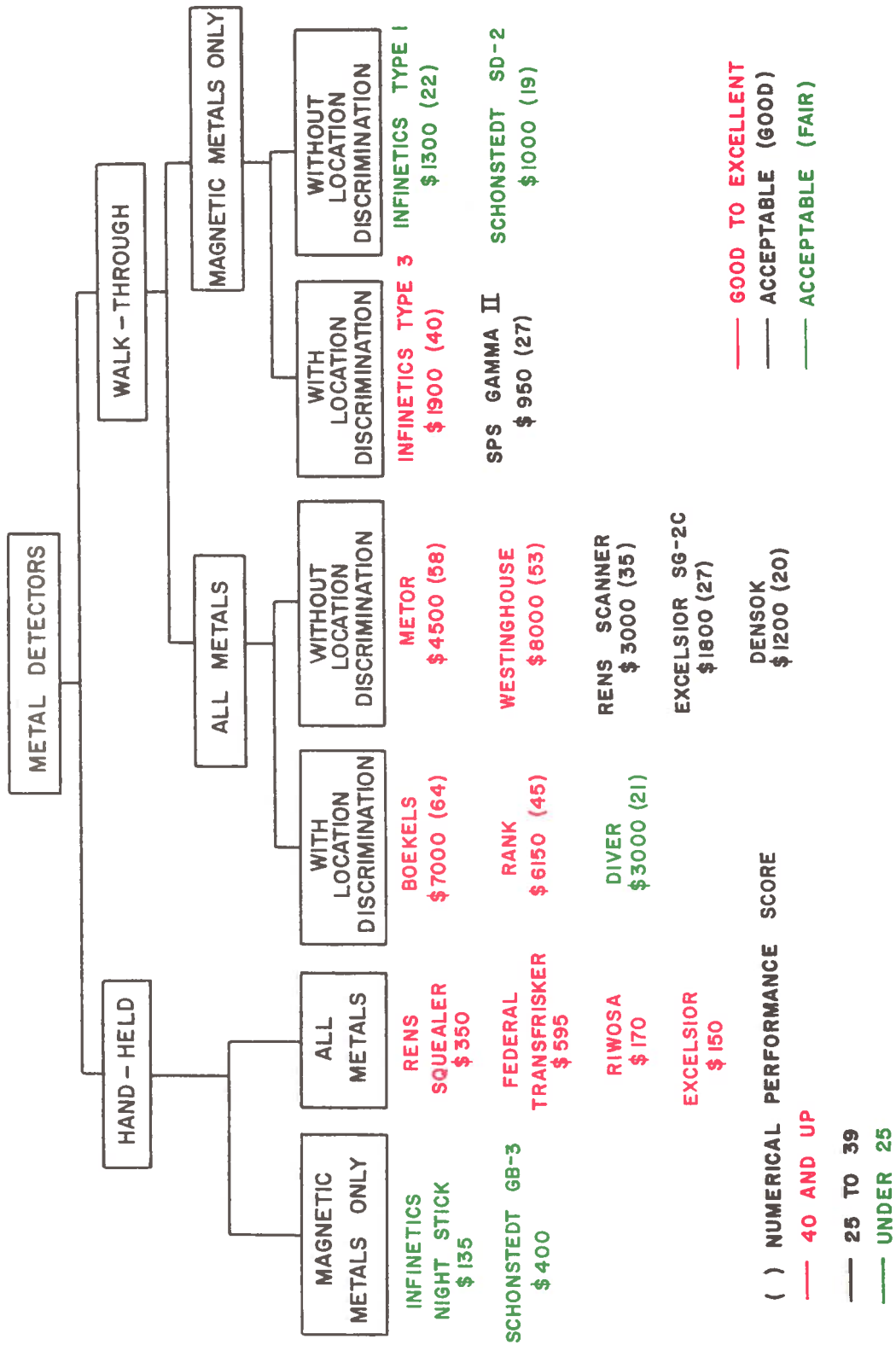


Figure 3. High-Risk Performance Ranking of Metal Detectors

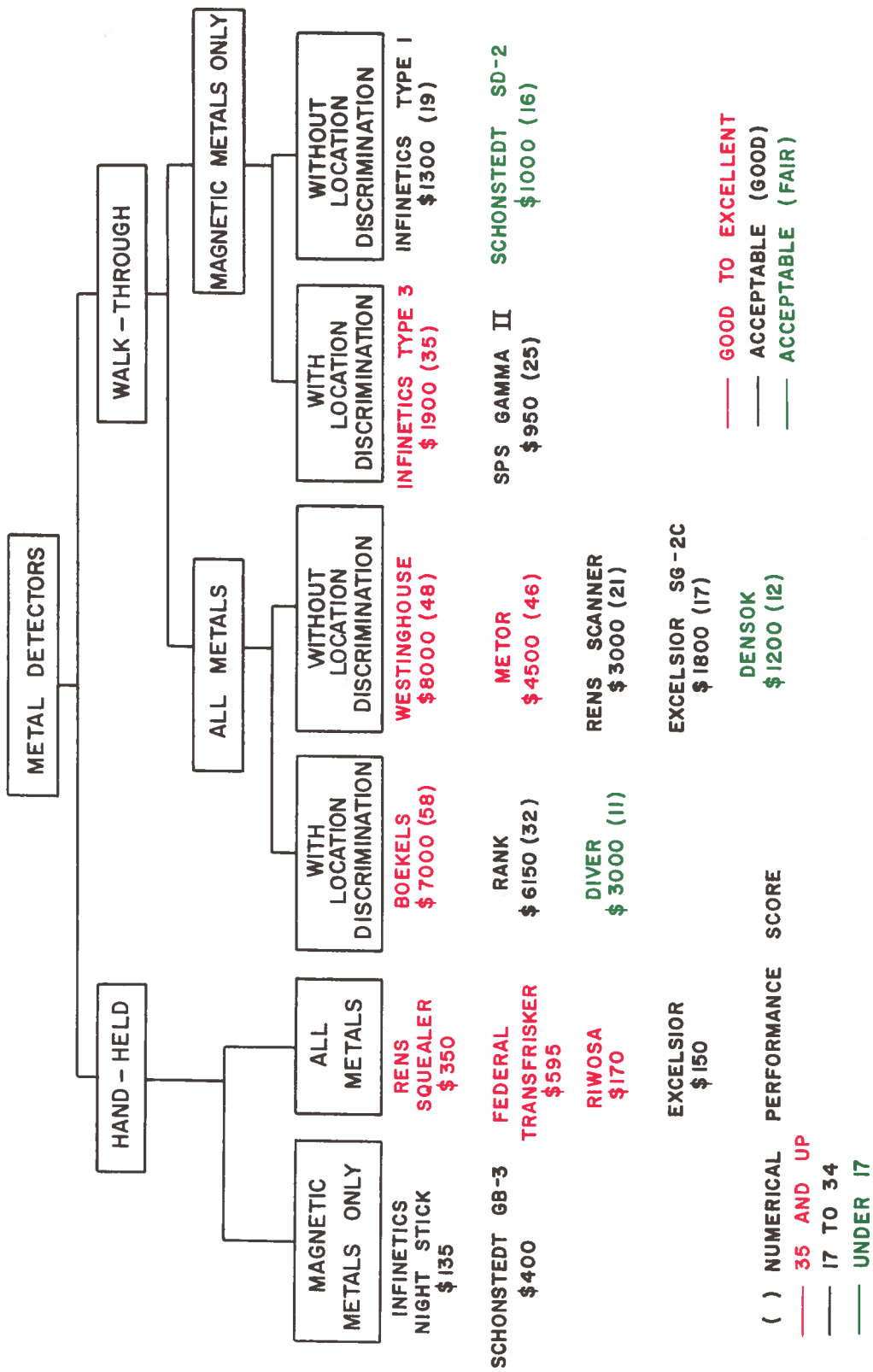


Figure 4. Low-Risk Performance Ranking of Metal Detectors

effectiveness ranking of all detectors is presented in Figure 5.

4.2 LOW-RISK CAPITAL COST-EFFECTIVENESS RANKING

For a capital cost below \$1,500 add 20 points to the low-risk performance score; for a capital cost above \$1,500 add 20 points minus 1 point for each \$100 in excess of \$1,500. For example, a detector costing \$2,700 merits 8 additional points. The low-risk capital cost-effectiveness ranking of all detectors is presented in Figure 6.

5.0 CONCLUSIONS

The performance ranking in Figures 3 and 4 indicates that three hand-held models in the second subgroup (Rens Squealer, Federal Transfisker and Riwosa) perform well under all conditions. They detect objects of all metals and also provide location discrimination. Of the walk-through installations, there are five models in the next three subgroups whose performance ranking is high in both high-risk and low-risk situations (Boekels, Rank, Metor, Westinghouse and Infinetics Type 3). However, only the information on the Metor and Westinghouse models is firm; the scores of the other three are best present estimates. In particular, the score of the Boekels model is based on data reported by the Federal Republic of Germany; Rank have modified their model from that tested at TSC; the Infinetics Type 3 model to date has only undergone limited field tests and has not been tested extensively in the TSC laboratory.

In the capital cost-effectiveness ranking (Figures 5 and 6), the same three hand-held detectors rate "good to excellent" in both high-risk and low-risk situations, since they perform well under all conditions and their cost is low. The ranking of walk-through installations, on the other hand, shows large differences. In the high-risk situations, four of the five models with the highest performance scores are also ranked highest in terms of capital

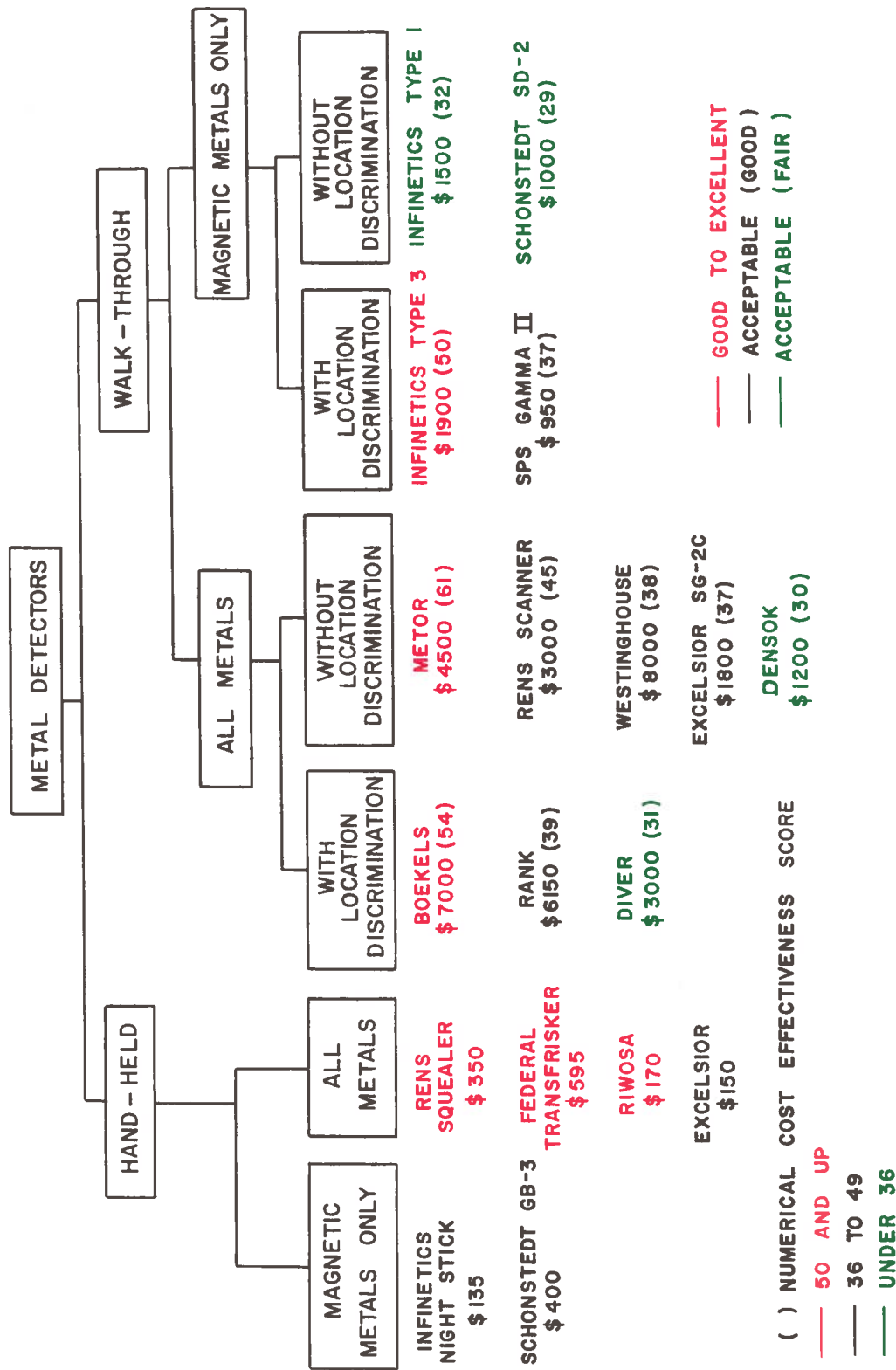


Figure 5. High-Risk Capital Cost-Effectiveness Ranking of Metal Detectors

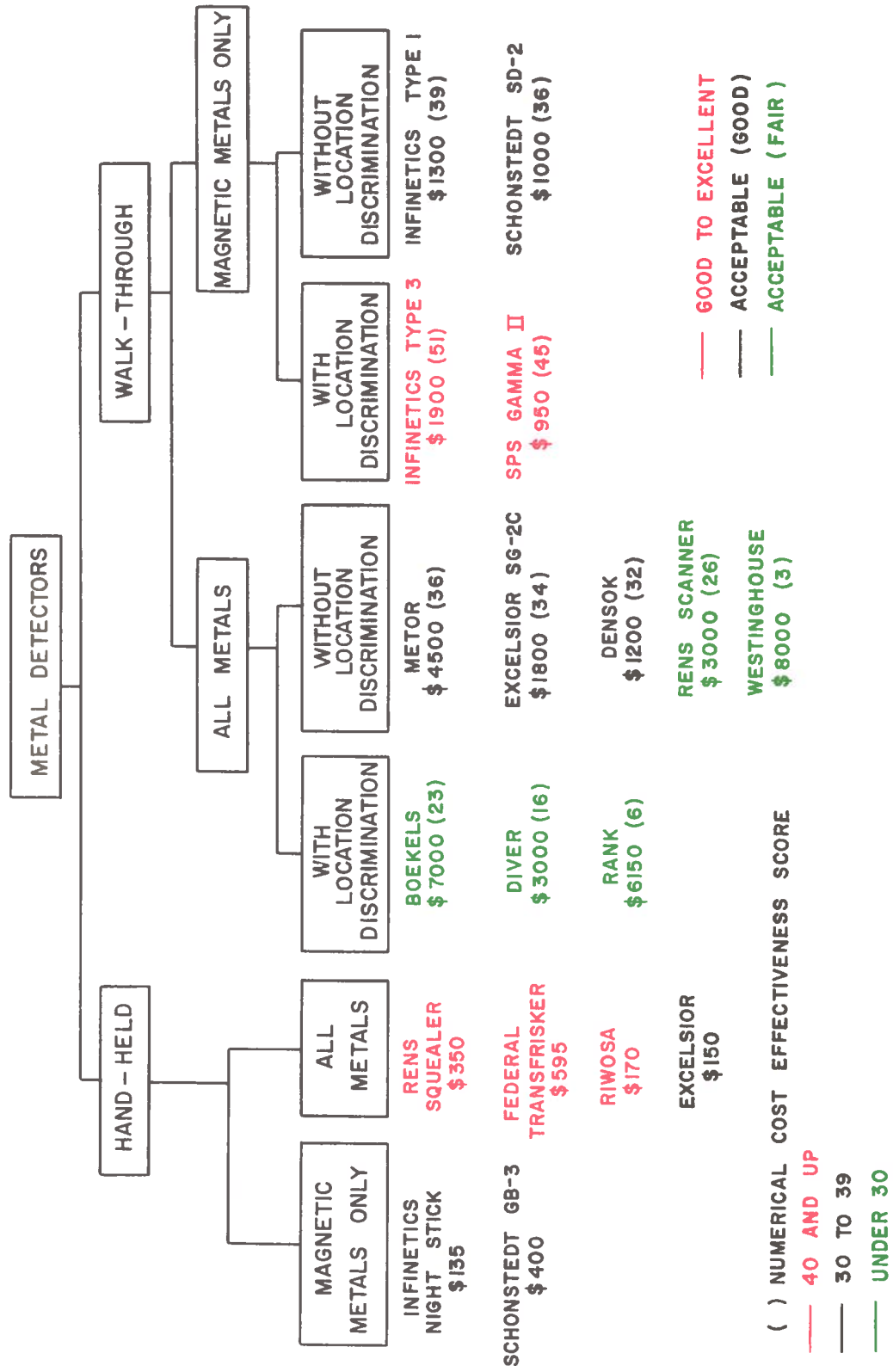


Figure 6. Low-Risk Capital Cost-Effectiveness Ranking of Metal Detectors

cost effectiveness. The relative capital cost of these models is directly related to the versatility of their respective subgroups. Highest cost: subgroup, "all metals, with location discrimination"; intermediate cost: subgroup, "all metals, without location discrimination"; lowest cost: subgroup, "magnetic metals with location discrimination." The ranking of walk-through installations in the low-risk situation (Figure 6) is dominated by the cost factor. Here the score of the high-priced models is much reduced. The only models rated "good to excellent" are in the fifth subgroup, "magnetic metals with location discrimination." These models are relatively low-priced and subject to few false alarms; they are limited to the detection of conventional weapons of magnetic materials. It is noteworthy, in all rankings (Figures 2 through 6) only the Infinetics Type 3 model is consistently among the top-scoring walk-through installations. For the conventional magnetic weapon this model appears to be the best detector among the several walk-through installations evaluated to date, both in terms of performance and capital cost effectiveness.

It should be stressed that no consideration has been given in this report to performance and cost effectiveness under operational conditions. The three hand-held units, for example, whose ranking is uniformly high, require at least one operator; for expediting passenger loading of large aircraft several operators are required. The operational cost effectiveness of these units therefore falls considerably below that of the more expensive walk-through installation which can operate in an automatic mode. In assessing the merits of a particular model, operational characteristics may turn out to be the dominant factor. A program to acquire this information in coordination with the FAA is now being implemented.

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Details of Commercial Metal Detectors

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Infinetics Type 1	39
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HAND-HELD
MAGNETIC METALS ONLY

DETECTOR - MAGNETIC METALS

Manufacturer: Schonstedt Instrument Co.
1775 Wiehle Avenue
Reston, VA 22070

Type and Model No.: Model GB-3 Magnetic Detector

Mode of Application: Battery operated electronic unit carried in pocket, sensor probe with arm straps, and earphone.

Physical Description: Worn under a jacket or overcoat, the electronic unit and sensor are completely concealed and earphone is hardly noticeable.

Cost: \$400.00

Delivery: Off-the-shelf

Operating Principle: Presence of object containing magnetic material (iron steel, but not nonmagnetic stainless steel) produces electrical signal.

Technical Evaluation: (based on limited field tests)

Space required: Scanning close to subject.

Response to extraneous metal objects and electrical disturbances: Low at distances greater than one foot.

Likelihood of false alarms: Medium

Operator's skill required: High

Need for adjustment: Occasional

Sensitivity: Will detect magnetic objects, occasionally including small knives.

Performance rating: Acceptable (Good)

Cost effectiveness: Acceptable (Good)

DETECTOR - MAGNETIC METALS

Manufacturer: Infinetics, Inc.
1601 Jessup Street
Wilmington, DE 19802

Type and Model No.: "Friskem" Night Stick Mark 3

Mode of Application: Battery operated, portable, selfcontained, hand-held search unit to scan subject at about 3 inches from subject.

Physical Description: Resembles policeman's night stick in appearance, etc.

Cost: \$135 (1), 117 (10-49), 113 (50 or more)

Delivery: Off-the-shelf

Operating Principle: Presence of object containing magnetic material (iron steel, but not nonmagnetic stainless steel) produces electrical signal.

Technical Evaluation: (based on laboratory tests at TSC)

Space required: Scanning at distance of about 3 inches from subject.

Response to extraneous metal objects and electrical disturbances: Low at distances of one foot.

Likelihood of false alarms: Low

Operator's skill required: Medium

Need for adjustment: Rare

Sensitivity: Will detect magnetic objects, including small knives.

Performance rating: Acceptable (good)

Cost effectiveness: Acceptable (good)

HAND-HELD
ALL METALS

DETECTOR - ALL METALS

Manufacturer: Federal Laboratories, Inc.
Saltsburg, PA 15681

Type and Model No.: Transfrisker #6010

Mode of Application: Battery-operated, hand-held search unit to scan subject at about 3 inches from subject.

Physical Description: Under 10 lbs., slightly bulky, search paddle about 4" x 10".

Cost: \$595.00

Delivery: Off-the-shelf

Operating Principle: Presence of metallic objects produces electrical signal.

Technical Evaluation: (based on limited field tests)

Space required: Scanning at distance of about 3 inches from subject.

Response to extraneous metal objects and electrical disturbances: Low at distances of one foot.

Likelihood of false alarms: Operator must be familiar with response to coins, keys or metal foil, to distinguish these from small metal weapons; or subject must divest himself of all extraneous metal.

Operator's skill required: Medium to high

Need for adjustment: Rare

Sensitivity: Will detect all metal objects, including small knives, readily.

Performance rating: Excellent

Cost effectiveness: Good to excellent

DETECTOR - ALL METALS

Manufacturer: Rens Manufacturing Co.
P. O. Box 337
Creswell, Oregon 97426

Type and Model No.: Squealer Model 15

Mode of Application: Battery-operated, hand-held search unit to scan subject at about 3 inches from subject.

Physical Description: Weight less than 2 lbs., 7" x 2" x 3", with 9" x 2" search loop--attractively housed.

Cost: \$350.00

Delivery: Off-the-shelf

Operating Principle: Presence of metallic object produces electrical signal.

Technical Evaluation: (based on exhaustive laboratory tests at TSC)

Space required: Scanning at distance of about 3 inches from subject.

Response to extraneous metal objects and electrical disturbances: Low at distances greater than one foot.

Likelihood of false alarms: Operator must be familiar with response to coins, keys, or metal foil, to distinguish these from small metal weapons; or subject must divest himself of all extraneous metal.

Operator's skill required: Medium to high.

Need for adjustment: Rare

Sensitivity: Will detect all metal objects, including small knives, readily.

Performance rating: Excellent

Cost effectiveness: Excellent

DETECTOR - ALL METALS

Manufacturer: Riwosa S. A.
Witikonerstrasse 80
8032 Zurich, Switzerland

Type and Model No.: Metal Detector MD-12

Mode of Application: Battery-operated, hand-held search unit to scan subject at about 3 inches from subject.

Physical Description: Under 5 lbs., circular loop about 6" in diameter for search.

Cost: \$170.00

Delivery: Off-the-shelf

Operating Principle: Presence of metallic objects produces electrical signal.

Technical Evaluation: (based on limited field tests)

Space required: Scanning at distance of about 3 inches from subject.

Response to extraneous metal objects and electrical disturbances: Low at distances greater than one foot.

Likelihood of false alarms: Operator must be familiar with response to coins, keys, or metal foil to distinguish these from small metal weapons; or subject must divest himself of all extraneous metal.

Operator's skill required: Medium to high

Need for adjustment: Rare

Sensitivity: Will detect all metal objects, including small knives, readily.

Performance rating: Good to excellent

Cost effectiveness: Excellent

DETECTOR - ALL METALS

Manufacturer: Excelsior Electronics Co.
Solco Engineering
7448 Deering Avenue
Canoga Park, CA 91303

Type and Model No.: Excelsior hand-held detector

Mode of Application: Battery-operated, hand-held search unit to scan subject at about 3 inches from subject.

Physical Description: Around 2 lbs., search loop 2" x 9".

Cost: \$150.00, usually included with walk-through gate (SG-2C).

Delivery: Off-the-shelf.

Operating Principle: Presence of metallic objects produces electrical signal.

Technical Evaluation: (based on exhaustive laboratory tests at TSC)

Space required: Scanning at distance of about 3 inches from subject.

Response to extraneous metal objects and electrical disturbances: Low at distances greater than one foot.

Likelihood of false alarms: Operator must be familiar with response to coins, keys, or metal foil, to distinguish these from small metal weapons; or subject must divest himself of all extraneous metal.

Operator's skill required: Medium to high.

Need for adjustment: Rare

Sensitivity: Will detect all metal objects, including small knives, readily.

Performance rating: Acceptable (Good)

Cost effectiveness: Acceptable (Good)

WALK-THROUGH
ALL METALS
WITH LOCATION DISCRIMINATION

DETECTOR - ALL METALS

Manufacturer: Dr. Hans Boekels & Co.
P. O. Box 847
51 Aachen, Federal Republic of Germany

Type and Model No.: Boekels Metal Detector for Control of Persons

Mode of Application: Walk-through gate

Physical Description: 96 1/2" high, 43 1/4" wide, 38 3/8" deep overall; 83" high, 29 1/2" wide, 35 1/2" deep aperture; weight about 1,320 lbs; with 16 indicators for 16 different locations on subject.

Cost: About \$7,000.00

Delivery: Experimental, airport tests in Germany anticipated.

Operating Principle: Presence of metallic object produces electrical signal.

Technical Evaluation: (based on Government reports on experimental model by Federal Republic of Germany)

Space required: Less than 10 feet in all directions from unit.

Response to extraneous metal objects and electrical disturbances: Extremely low.

Likelihood of false alarms: Extremely low.

Operator's skill required: Medium

Need for adjustment: Occasional

Sensitivity: Will detect all metal weapons, and often discriminate between them and innocuous metal objects.

Performance rating: Excellent

Cost effectiveness: Good

DETECTOR - ALL METALS

Manufacturer: Rank Precision Industries, Ltd.
Rank Pullin Controls
Phoenix Works, Great West Road
Brentford, Middlesex, United Kingdom

American Rep.: Rank Precision Industries, Inc.
260 North Route 303
West Nyack, NY 10994

Type and Model No.: Metal Weapon Detector, MWD/Air I

Mode of Application: Walk-through gate.

Physical Description: Walk-through doorway: 9.7 ft. x 6 ft. x 3.2 ft., with indicators for different locations on subject.

Cost: \$6,150 (1), 5,875 (10-49), 5,200 (50 or more)

Delivery: Orders of more than 10, U. S. Manufacture, 60 days

Operating Principle: Presence of metallic object produces electrical signal.

Technical Evaluation: (based on exhaustive laboratory testing at TSC)

Space required: 10 feet in all directions from unit.

Response to extraneous metal objects and electrical disturbances: Low

Likelihood of false alarms: Low, because of location discrimination, metal support in men's shoes can be quickly determined, as well as location of innocuous metal.

Operator's skill required: Medium

Need for adjustment: Occasional, depends on volume of passengers.

Sensitivity: Will detect all metal objects larger than small keycase.

Performance rating: Good

Cost effectiveness: Good

DETECTOR - ALL METALS

Manufacturer: Diver Detection Devices, Ltd.
Griff Clara, near Nuneaton
Worcs., England, U. K.

Type and Model No.: "Diver" Detection Device

Mode of Application: Walk-through gate

Physical Description: Doorway consisting of rectangular posts connected by wooden lintel, with upper and lower zones.

Cost: \$3,000.00

Delivery: Off-the-shelf to 90 days.

Operating Principle: Presence of metallic object produces electrical signal.

Technical Evaluation: (based on limited field tests)

Space required: 10 or more feet in all directions from unit.

Response to extraneous metal objects and electrical disturbances: Fair

Likelihood of false alarms: Fair

Operator's skill required: Medium

Need for adjustment: Occasional, especially due to problems of drift.

Sensitivity: Will detect all metal objects larger than small keycase; discrimination between regions of upper and lower body.

Performance rating: Fair

Cost effectiveness: Fair

WALK-THROUGH
ALL METALS
WITHOUT LOCATION DISCRIMINATION

DETECTOR - ALL METALS

Manufacturer: Westinghouse Electric Corporation
Specialty Electronics Division
Box 8606
Pittsburgh, PA 15221

Type and Model No.: WD-4 Weapon Detector

Mode of Application: Walk-through gate.

Physical Description: Walk-through housing, 78" x 53" x 30", attractive, light-colored plastic, attractively contoured--also carpeted walking area.

Cost: About \$8,000.

Delivery: About 90 days or more.

Operating Principle: Presence of metallic object produces electrical signal.

Technical Evaluation: (based on exhaustive laboratory tests at TSC)

Space required: 10 feet in all directions from unit.

Response to extraneous metal objects and electrical disturbances: Low

Likelihood of false alarms: Extremely low, even from metal support in men's shoes.

Operator's skill required: Medium to major.

Need for adjustment: Occasional, although most of the time the pressing of one button proves sufficient.

Sensitivity: Will detect all metal weapons and usually discriminate between them and innocuous metal objects.

Performance rating: Excellent

Cost effectiveness: Good

DETECTOR - ALL METALS

Manufacturer: Outokumpu Oy
Research Laboratory
Tapiola, Finland

American Rep.: Harrison R. Cooper Associates
AMF Box 146
Salt Lake City, Utah 84101

Type and Model No.: Metor Airport Security Metal Detector

Mode of Application: Walk-through gate.

Physical Description: Heavy, very attractive glass fiber frame. Dimensions:
8 ft. high, 8 ft. long, 5 ft. wide.

Cost: \$4,500 (1-49), 4,000 (50 or more). Orders 10 units and
up, U. S. manufacture.

Delivery: About 60 days.

Operating Principle: Presence of metallic object produces electrical signal.

Technical Evaluation: (based on exhaustive laboratory testing at TSC)

Space required: 20 feet in all directions from unit.

Response to extraneous metal objects and electrical
disturbances: Low

Likelihood of false alarms: Extremely low, except for
occasional response to metal supports in men's shoes.

Operator's skill required: Medium

Need for adjustment: Occasional, especially to readjust
balance setting.

Sensitivity: Will detect all metal objects, usually
even small knives and guns.

Performance rating: Excellent

Cost effectiveness: Good to excellent.

DETECTOR - ALL METALS

Manufacturer: Rens Manufacturing Co.
P. O. Box 337
Creswell, Oregon 97426

Type of Model No.: Rens Personnel Scanner - PS-6

Mode of Application: Walk-through gate.

Physical Description: 84.5" x 38.2" x 22.5", attractively finished in padded vinyl.

Cost: \$3,000.00

Delivery: Off-the-shelf in small quantities.

Operating Principle: Presence of metallic object produces electrical signal.

Technical Evaluation: (based on limited field tests)

Space required: 10 feet in all directions from unit.

Response to extraneous metal objects and electrical disturbances: low

Likelihood of false alarms: fair

Operator's skill required: minor

Need for adjustment: infrequent

Sensitivity: will detect all metal objects larger than small knife.

Performance rating: Good

Cost effectiveness: Good

DETECTOR - ALL METALS

Manufacturer: Excelsior Electronics Co.
Solco Engineering
7448 Deering Avenue
Canoga Park, CA 91303

Type and Model No.: Excelsior SG-2C Metal Detector

Mode of Application: Battery-operated, walk-through gate.

Physical Description: 88 1/2" high x 38" wide; weight 50 lbs., plywood construction with walnut exterior.

Cost: \$1,800.00

Delivery: Off-the-shelf.

Operating Principle: Presence of metallic objects produces electrical signal.

Technical Evaluation: (based on exhaustive laboratory testing at TSC)

Space required: 10 feet in all directions from unit.

Response to extraneous metal objects and electrical disturbances: Low

Likelihood of false alarms: High, due to metal support in men's shoes and sundry small metal objects.

Operator's skill required: Minor

Need for adjustment: Infrequent.

Sensitivity: Will detect all metal objects larger than keycase, including many commonly carried innocuous items-- although will occasionally permit small weapons to pass through.

Performance rating: Good

Cost effectiveness: Good

DETECTOR - ALL METALS

Manufacturer: Densok Measuring Instrument Works, Ltd.
Nikko Shoji Co., Ltd.
Tokyo International Airport
Haneda Ota-ku, Tokyo, Japan

Type and Model No.: "Magnetic Eye" (Type-MGG)

Mode of Application: Walk-through rectangular loop coil gate.

Physical Description: Lightweight enclosed coil about 1 inch in diameter,
8 ft. high, 3 ft. wide.

Cost: \$1,200.00

Delivery: Off-the-shelf.

Operating Principle: Presence of metallic object produces electrical signal.

Technical Evaluation: (based on exhaustive laboratory testing at TSC)

Space required: 20 feet in all directions from unit.

Response to extraneous metal objects and electrical disturbances: High

Likelihood of false alarms: High, due to metal support in men's shoes and sundry small metal objects; low to medium, due to metal foil wrapping.

Operator's skill required: Minor

Need for adjustment: Infrequent to occasional, depending on initial installation.

Sensitivity: Will detect all metal objects larger than small knife.

Performance rating: Fair

Cost effectiveness: Fair to good

WALK-THROUGH
MAGNETIC METALS ONLY
WITH LOCATION DISCRIMINATION

DETECTOR - MAGNETIC METALS

Manufacturer: Infinetics, Inc.
1601 Jessup Street
Wilmington, DE 19802

Type and Model No.: "Friskem" Type 3 walk-through station

Mode of Application: Semifixed tower type, walk between mounted doorway panels.

Physical Description: Separation of changeable decor panels about 3 ft., about 6 ft. high, with different indicators for different locations on subject.

Cost: \$1,900 (1), 1,653 (10-49), 1,596 (50 or more)

Delivery: Off-the-shelf

Operating Principle: Presence of object containing magnetic material (iron steel, but not nonmagnetic stainless steel) produces electrical signal.

Technical Evaluation: (based on limited field tests)

Space required: About 10 feet in every direction from unit.

Response to extraneous metal objects and electrical disturbances: Medium; unit can indicate the direction from which the disturbance originates.

Likelihood of false alarms: Medium, although location discrimination minimizes this problem.

Operator's skill required: Low to medium

Need for adjustment: Occasional

Sensitivity: Will detect most objects constructed of magnetic metal larger than a small knife.

Performance rating: Good to excellent

Cost effectiveness: Good to excellent

DETECTOR - MAGNETIC METALS

Manufacturer: SPS, Inc.
P. O. Box 1278
Greenville, TX 75401

Type and Model No.: Gamma 2WD Concealed Weapon Detector

Mode of Application: Walk between two or more 3-inch cubes attached to posts in a semipermanent fashion.

Physical Description: Detector consists of 3-inch cubes to be attached to the side of existing walkways or posts or poles, separated by about 3 feet.

Cost: \$950.00 (1), 900 (10 or more)

Delivery: Off-the-shelf

Operating Principle: Presence of object containing magnetic material (iron steel, but not nonmagnetic stainless steel produces electrical signal.

Technical Evaluation: (based on exhaustive laboratory tests at TSC)

Space required: About 20 feet in every direction from sensor units.

Response to extraneous metal objects and electrical disturbances: Medium, especially if large objects constructed of magnetic material are in motion in the vicinity.

Likelihood of false alarms: Medium, although location discrimination reduces this problem.

Operator's skill required: Low to medium

Need for adjustment: Occasional, especially dependent on attachment of sensor units to posts or doorway.

Sensitivity: Will detect many objects constructed of magnetic metal larger than a small knife provided the sensor units are properly located and maintained.

Performance rating: Good

Cost effectiveness: Good

WALK-THROUGH
MAGNETIC METALS ONLY
WITHOUT LOCATION DISCRIMINATION

DETECTOR - MAGNETIC METALS

Manufacturer: Infinetics, Inc.
1601 Jessup Street
Wilmington, DE 19802

Type and Model No.: "Friskem" Walk-through station Type 1

Mode of Application: Semifixed tower type, walk between poles.

Physical Description: Separation of poles 30" to 36", 6 ft. high, 1 1/4 inches in diameter.

Cost: \$1,300 (1), 1,131 (10-49), 1,092 (50 or more)

Delivery: Off-the-shelf

Operating Principle: Presence of object containing magnetic material (iron, steel, but not nonmagnetic stainless steel) produces electrical signal.

Technical Evaluation: (based on exhaustive laboratory tests at TSC)

Space required: About 20 feet in every direction from unit.

Response to extraneous metal objects and electrical disturbances: Medium, especially if large objects constructed of magnetic material are in motion in the vicinity.

Likelihood of false alarms: Medium, especially due to metal support in men's shoes.

Operator's skill required: Low

Need for adjustment: Infrequent

Sensitivity: Orientation sensitive. Will detect most objects constructed of magnetic metal larger than a small knife.

Performance rating: Fair to good

Cost effectiveness: Good

DETECTOR - MAGNETIC METALS

Manufacturer: Schonstedt Instrument Co.
1775 Wiehle Avenue
Reston, VA 22070

Type and Model No.: Magnetic Surveillance SD2

Mode of Application: Walk between poles

Physical Description: Lightweight, including small pedestals for poles--
separation of 30" to 36", 5 ft. high, 1 1/8" in
diameter.

Cost: \$1,000.00

Delivery: Off-the-shelf

Operating Principle: Presence of object containing magnetic material (iron,
steel, but not nonmagnetic stainless steel) produces
electrical signal.

Technical Evaluation: (based on exhaustive laboratory tests at TSC)

Space required: About 20 feet in every direction from
unit.

Response to extraneous metal objects and electrical
disturbances: Medium, especially if large objects
constructed of magnetic material are in motion in
the vicinity.

Likelihood of false alarms: Medium, especially due to metal
support in men's shoes.

Operator's skill required: Low

Need for adjustment: Infrequent

Sensitivity: Orientation sensitive. Will detect most
objects constructed of magnetic metal larger than a
small knife.

Performance rating: Fair

Cost effectiveness: Good